Oversættelse af europæisk patentskrift

Prioritet: 2007-02-06 IT BO20070068

Patenthaver: CORIMA INTERNATIONAL MACHINERY S.r.l., Via Bellini 4, 43022 Montechiarugolo (PR), Italien

Opfinder: BALDASSARI, Gianfranco, Via Bellini, 4, Frazione Monticelli Terme, I-43022 Montechiarugolo, Italien

Fuldmægtig i Danmark: Larsen & Birkeholm A/S Skandinavisk Patentbureau, Banegårdspladsen 1, 1570 København V, Danmark

Benævnelse: Indretning til elektroforetisk maling af metalgenstande, især lag til beholdere til levnedsmiddelbrug

Fremdragne publikationer:
EP-A-0 971 051
WO-A-94/25645
WO-A-02/072284
GB-A-943 038
US-A-4 005 000
DESCRIPTION

TECHNICAL FIELD

[0001] The invention relates to the technical sector concerning painting metal objects, in particular lids for food-use containers, realised by immersing the lids in an electrophoretic bath.

BACKGROUND ART

[0002] Lids for closing containers used for storing food products usually include a pre-fractured line which facilitates opening of the container.

[0003] The pre-fracture line is made on lids which have already been painted, so the pre-fracturing operation might cause cracks and/or breaks in the covering paint.

[0004] The lids therefore require a further stage of painting in order to cover the exposed points.

[0005] Document EP 0.971.051 describes an apparatus for performing repainting on lids, by immersing them in an electrophoretic bath.

[0006] The apparatus described in this document comprises a tank containing an electrophoretic bath, an electrode, for example a negative-polarity electrode (cathode), immersed in the bath; a conveyor line bearing support elements for the lids to convey them in immersion internally of the bath in the tank, and a contact unit, for example having positive polarity (anode), to establish an electrical contact with the lids during transit thereof immersed in the bath, which contact unit is positioned above the tank.

[0007] The contact of the lids immersed in the bath with the anode contact unit determines passage of the current from the negative electrode (cathode), via the electrophoretic bath, to the lids themselves: in consequence of this passage of current, the solid particles present in the bath adhere to the lid, mainly in the exposed points, and coat them.

[0008] The contact unit for realising an electrical contact with the lids, for example with a negative polarity (anodic unit), used in the apparatus described in EP 0.971.051, is very complex.

[0009] It comprises a chain element arranged ring-wound with an operative tract that extends parallel above the tract of the conveyor line along which the lids are immersed in the bath.

[0010] The chain element is provided with support blocks, made of a non-conductive material, to which small tongues are fastened, made of a conductive material, such as to be positioned transversally to the chain element.

[0011] The tongues are destined to make contact with the lids transiting immersed internally of the bath of the tank.

[0012] In this respect, each tongue comprises a first end for contacting the lids, and a second end for contacting an electrically positively-polarised bar, positioned parallel to the operative tract of the chain element.

[0013] The chain element must be activated such that the tongues, which run along the operative tract which extends above the conveyor line, first contact (with their first end) the transiting lids immersed in the bath, and consequently contact, with their second ends, the positively-polarised bar, in order to obtain anodic contact with the lids, when they are still immersed in the bath.

[0014] The above-described anodic unit exhibits a complex structure, and the cleaning operations of the single tongues are not particularly easy and also require the apparatus to be stopped.

[0015] Further, maintenance in the case of breakage of one or more tongues requires a considerable inoperative time.

[0016] The aim of the present invention is therefore to provide an apparatus for electrophoretic repainting of metal objects, in particular lids for containers for food use, which can realise an electrical contact with the lids immersed in the electrophoretic bath in a way which is both simple and immediate.
[0017] A further aim of the invention is to provide an apparatus for electrophoretic repainting of lids for containers of food products, which enables the contact units, which contact the lids, to be cleaned without having to stop the apparatus from operating.

[0018] A further aim of the invention is to provide an apparatus for electrophoretic repainting of lids which is provided with a unit for electrical contact with the immersed lids, which has a simple and functional structure in realisation of the contact with the lids immersed in the electrophoretic bath.

DISCLOSURE OF INVENTION

[0019] The above-described aims are entirely attained with an apparatus for electrophoretic repainting of metal objects, in particular for lids of containers for food use, comprising a bath containing an electrophoretic bath; an electrode immersed in the electrophoretic bath; a conveyor line provided with elements for supporting lids, the line being arranged such as to transit internally of the tank in order to immerse the lids in the electrophoretic bath; a unit for establishing electrical contact with the lids transiting immersed in the bath, having an opposite polarity with respect to a polarity of the electrode immersed in the bath, in which the contact unit comprises a rotation element, made rotatable with respect to a longitudinal axis thereof, parallel to the advancement direction of the conveyor line when transiting in immersion in the tank, an external surface of which affords a helical groove having an internal profile such as to be able to receive at least an end portion of the lids, a rotating arrangement of the rotatable element above the bath, and with respect to the conveyor line, being such that at least a point of the internal profile of the groove maintains contact with the end portion of the lids during the immersed transit thereof in the solution of the bath; characterized in that the said support elements are such as to retain the lids, enabling the lids to advance along the conveyor line but without any constriction, so that the lids are freely retained by the support elements of the conveyor line, the contact between at least a point of the profiles of the electrical means and the end portion allowing the lids to be rotated with respect to the support elements, in consequence of the rotation of the rotation element.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Further characteristics and advantages of the present invention will better emerge from the following description of a preferred embodiment of the invention, made with reference to the accompanying figures of the drawings, in which:

figure 1 is a schematic illustration of a partially-sectioned lateral view of an apparatus for electrophoretic repainting of metal objects, in particular lids for containers for food use, object of the present invention;
figure 2 is an enlarged scale illustration with respect to figure 1, of a particularly significant element of the present invention;
figure 3 is an enlarged view of the detail denoted by the letter V in figure 2;
figure 4 is an axial section of a variant of what is illustrated in figure 2;
figure 5 illustrates, with some parts removed and some in view, a metal helix used in the variant of figure 4;
figure 6 is an axial section of a portion of the tubular nucleus used in the variant of figure 4;
figure 7 illustrates, in enlarged scale, the detail W of figure 4.

BEST MODE FOR CARRYING OUT THE INVENTION

[0021] With reference to the figures of the drawings, in particular figure 1, 100 denotes in its entirety an apparatus for electrophoretic repainting of metal objects, in particular lids for containers of food products.

[0022] The apparatus 100 is provided with a conveyor line 10 exhibiting support elements for receiving and retaining the lids 20 to be subjected to repainting.
[0023] The lids 20 to be repainted are directed towards the conveyor line by means of a conveyor 8.

[0024] The conveyor line 10, as illustrated in figure 1, develops according to a closed ring-wound trajectory about relative guide and activation wheels and, in particular, includes an upper straight tract 13 arranged such as to convey the lids 20 under immersion internally of an electrophoretic bath contained in a tank 30.

[0025] An electrode (not illustrated) is positioned internally of the tank 30, which electrode can have negative polarity (cathode) or positive polarity (anode) according to the type of electrophoretic bath used.

[0026] A unit 40 for establishing electric contact with the lids 20 during the transit thereof in immersion in the electrophoretic bath of the tank 30 is positionable above the tank 30 and the upper straight tract 13 of the conveyor line 10.

[0027] The unit 40 exhibits an opposite polarity to the polarity of the electrode immersed in the bath.

[0028] For example, in the case of an anaphoretic bath, the electrode immersed in the bath will have a negative polarity (cathode) and the contact unit 40 will have a positive polarity (anode), while in the case of a cataphoretic bath the electrode in the bath will have a positive polarity (anode) while the unit 40 will have a negative polarity (cathode).

[0029] In the following description reference will be made, purely by way of non-limiting example, to an anaphoretic bath, i.e. with a contact unit 40 having positive polarity (anode).

[0030] The contact unit 40 is connected to the positive pole of a constant voltage generator (not illustrated) while the above-mentioned negative-polarity electrode (cathode), immersed in the tank, is connected to the negative pole of the generator.

[0031] The positive polarity contact unit 40, as illustrated in detail in figure 2, is constituted by a rotation element 4, rotatable with respect to the longitudinal axis 45 thereof.

[0032] In the embodiment of figures 2-3, the rotation element 4 is constituted by a cylindrical nucleus of conductor material.

[0033] The external lateral surface 42 of the rotatable element 4 affords a helical groove 5, which groove 5 exhibits an internal profile 51 of such a dimension as to receive at least an end portion 21 of the lids 20 (see, for example, figure 3).

[0034] Further, as is well illustrated in figures 2 and 3, the rotation element 4 is positionable above the tank 30 of the upper straight tract 13 of the conveyor line 10 such that at least a point of the internal profile 51 of the groove 5 maintains contact with the end portion 21 of the lids 20 during transit thereof in immersion in the bath of the tank 30.

[0035] In practice, when a lid 20 is conveyed immersed in the bath of the tank and consequently below the rotation element 4, the helical groove 5 of the rotation element 4 captures the relative portion of upper end 21 and, thanks to the continuous rotation of the rotation element 4 and the helix developing along the external lateral surface 42 thereof, accompanies the end portion 21 of the lid 20 during the advancement thereof along the straight tract 13 of the conveyor line 10.

[0036] In this regard, the speed of rotation of the rotation element 4 has to be specially synchronised with the advancement speed of the lids 20, immersed in the bath of the tank 30, along the upper straight tract 13 of the conveyor line 10.

[0037] The rotation element 4 can be realised in any conductive material suitable to be positively polarised and to realise an anodic-type contact with the lids.

[0038] As illustrated in the special embodiment of figure 2, the rotation element 4 is constituted by a cylinder arranged with the longitudinal axis 45 thereof parallel to the advancement direction W of the conveyor line 1 when transiting in immersion in the tank, and the groove 51 is none other than a helical threading realised in the external lateral surface 42 of the cylinder 4.

[0039] The rotation element 4, in other embodiments which are not illustrated, can be constituted by an endless screw, with a relative helical thread, or by a conical or truncoconical element, also provided with a helical thread on the external lateral surface thereof.

[0040] In the latter case, the conical or truncoconical element will be arranged above the tank, and with respect to the upper straight line of the conveyor line, such that a relative directrix of the lateral surface is parallel to the advancement direction of the conveyor line 10 when transiting immersed in the tank.
[0041] The step of the helical thread on the external lateral surface of the rotation element 4 is suitably equal to a distance between the support elements of the lids 20 of the conveyor line 10.

[0042] As illustrated in figure 3, the contact between the internal profile 51 of the groove 5 (thread) and the end portion 21 of the lids can occur at a lateral wall of the profile 51.

[0043] Alternatively, in other embodiments which are not illustrated, the contact can also be realised between a bottom wall and the end portion 21 of the lids 22 or, contemporaneously, between a lateral wall and a bottom wall of the profile 51, and the end portion 21 of the lids 20.

[0044] This will depend on the relative positioning selected and set between the rotation element 4 and the upper straight tract 13 of the conveyor line 10 immersed in the bath in the tank.

[0045] The advantageous characteristic of the present invention, is constituted by the fact that the lids are freely retained by the relative support elements of the conveyor line 10, the support elements being such as to retain the lids, enabling the lids to advance along the conveyor line but without any constriction.

[0046] Consequently it is possible to realise a dragging contact between the internal profile 51 of the groove 5 (thread) of the rotation element 4 and the end portion 21 of the lids such that the lids 20 are rotatable with respect to the support elements.

[0047] In this way, the transiting lids immersed in the bath in the tank, during their contact with the groove 5 of the rotation element 4, i.e. with the negative polarising unit, are rotated in the electrophoretic bath, enabling the particles in the bath to adhere to each point on the surface of the lids themselves, even those points which, if there were no rotation, would be situated at the support elements.

[0048] The provided apparatus further advantageously exhibits a rotating brush element 60, or roller, which is specially arranged above the rotation element 4, with the external surface of the brush or roller in a position of slight interference with the external lateral surface 42 thereof.

[0049] The function of the brush or rotating roller 60 is that of maintaining both the external lateral surface 42 and the groove 5 (thread) of the rotation element 4 constantly clean.

[0050] The cleaning operations of the positive polarity unit (anode) can thus be performed without any interruption in the functioning of the apparatus.

[0051] The rotation element 4 (anodic unit) is connected, via a non-conductive joint, to a relative rotation operation motor (not illustrated in the figures of the drawings).

[0052] From the above, the advantages of the present invention clearly emerge:

the particularly simple structure of the unit for electrical contact with the lids (which unit can have a positive polarity, anode, or negative, cathode), constituted simply by a rotation element;

the realisation of an electrical contact (anodic or cathodic) which is direct and functional with the lids, thanks to the helical groove (thread) present in the external lateral surface of the rotation element 4 which contactingly accompanies the lids during the advancement thereof along the conveyor line, immersed in the electrophoretic bath;

the possibility of effecting a cleaning of the contact unit (rotation element) without having to interrupt functioning of the apparatus;

the performing of a complete repainting operation on each point of the lids, inasmuch as these are rotatable with respect to the relative support elements internally of the electrophoretic bath thanks to the continuous dragging contact between the internal profile of the groove and an end portion of the lids.

[0053] In the embodiment of figures 4-7, the rotation element 4 is constituted by a tubular nucleus 400 of an insulating material keyed, in a known way, on a shaft 450. The nucleus and the external surface exhibit a helical groove 500; the internal surface 420 of the groove progresses helically.
[0054] A metal helix 600 having a constant rectangular section is inserted in the groove 500, the helix 600 being of a size and having an elastic constant such as to adhere and elastically press on the internal surface 420 of the groove 500 (see figures 4 and 7); an expert in the field will use a good electrical conductor for the helix.

[0055] A sleeve 650 is comprised internally of the tubular nucleus 400, which sleeve 650 is keyed on the shaft 450 in a known way.

[0056] A free space is defined between the external surface of the sleeve and the internal surface of the tubular nucleus, in which free space annular magnets 700, coaxial with the shaft 450, are inserted.

[0057] The expert in the sector will be aware of means for supplying tension to the metal helix 600.

[0058] In the embodiment illustrated in figures 4-7, the only part of the rotation element 4 under tension is the metal helix 600; electric arcs cannot be generated between the inclined part 420A of the groove 500 and the end portion 21 of the lid 20 (see figure 7), as the tubular nucleus 400 is made of an insulating material.

[0059] The action of the magnetic field produced by the magnets 700 determines a radial force F on the lids 20 (which are metallic), which radial force F leads the end portions 21 of the lids 20 to contact the relative inclined parts 420A of the grooves 500 (figure 7); this leads to positioning the lids at the same level.

[0060] The maintenance of the rotation element 4 includes replacing the metal helix 400 when worn with a new one. This is rapid and simple to do.

[0061] The invention has been described with reference to the case of anaphoretic-type repainting, i.e. with the contact unit positively polarised; it could, however, as previously mentioned, be applied also to the case of cataphoretic-type repainting, i.e. with the contact unit negatively polarised.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP0971051A [0085] [0098]
PATENTKRAV

1. Indretning (100) til elektroforetisk ommaling af metalgenstande, især låg (20) til beholdere til levnedsmiddelbrug, omfattende:

en tank (30), der indeholder et elektroforetisk bad; en elektrode, der er nedsænket i det elektroforetiske bad;
en transportlinje (10), der er forsynet med støtteelementer til låg (20), hvor transportlinjen (10) er anbragt, så at den passerer indvendigt i tanken (30) for at nedsænke lågene (20) i det elektroforetiske bad;
en enhed (40) til at etablere en elektrisk kontakt med lågene (20), der passerer nedsænket i badet, som har en modsat polaritet i forhold til en polartet af elektroden, der er nedsænket i badet, hvor kontaktenheden (40) indbefatter et rotationselement (4), der kan rotere om en længdeakse (45) deraf parallel med transportlinjens (10) fremføringsretning (W), når den passerer nedsænket i tanken (30), hvor en udvendig sideflade (42) af rotationselementet (4) udviser en rille (5) (500) med et spiralformet forløb, der er beregnet til at optage elektriske lederorganer for at opnå kontakt med mindst et endeparti (21) af lågene (20), hvor anbringelsen af rotationselementet (4) over tanken (30) og i forhold til transportlinjen (10) er således, at mindst et punkt af de elektriske lederorganer opretholder kontakt med lågenes (20) endepartier (21) under passagen deraf nedsænket i badet i tanken (30);

kendtegnet ved, at støtteelementerne er sådanne, der fastholder lågene (20) og gør det muligt for lågene (20) at blive fremført langs transportlinjen (10) men uden nogen begrænsning, således at lågene (20) fastholdes frit af transportlinjens (10) støtteelementer, hvor kontakten mellem mindst et punkt af de elektriske organers profiler og endepartiet (21) tillader lågene (20) at blive roteret i forhold til støtteelementerne som følge af rotationselementets (4) rotation.
2. Indretning (100) ifølge krav 1, kendetegnet ved, at lederorganerne omfat-ter rotationselementet (4), der udgøres af cylindrisk kerne af ledende materiale, og ved, at rillens (5) indre profil (51) udvikler sig spiralformet og er således, at mindst et punkt af profilet opretholder kontakt med lågenes (20) endeparti (21).

3. Indretning (100) ifølge krav 1, kendetegnet ved, at lederorganerne er en spiral (600), der er fremstillet af et ledende materiale, der er indført i rillen (500) i rotationselementet (4), hvor rotationselementet (4) udgøres af en rørformet kerne (400), der er fremstillet af et isolerende materiale, hvor spiralen (600) har en overflade, der udvikler sig spiralformet således, at mindst et punkt af spiralen (600) opretholder kontakt med lågenes (20) endeparti (21).

4. Indretning (100) ifølge krav 2 eller 3, kendetegnet ved, at kernen (400) er anbragt i forhold til tanken (30) og transportlinjen (10) således, at en relativ længdeakse (45) deraf er parallel med linjens (10) fremføringsretning (W), når den passerer nedsænket i badet i tanken (30).

5. Indretning (100) ifølge krav 2, kendetegnet ved, at rillen (5) udgøres af et spiralformet gevind, der er udformet på en ydre lateral overflade af cylinderen (4).

6. Indretning (100) ifølge krav 2, kendetegnet ved, at rotationselementet (4) udgøres af en snekke, hvor snekken er anbragt i forhold til tanken (30) og transportlinjen (10) således, at en længdeakse deraf er parallel med linjens (10) fremføringsretning (W), når den passerer nedsænket i badet i tanken (30).

7. Indretning (100) ifølge krav 6, kendetegnet ved, at rillen (5) udgøres af et spiralformet gevind, der er udformet på en ydre overflade af snekken.

8. Indretning (100) ifølge krav 2, kendetegnet ved, at rotationselementet (4) udgøres af et kægleformet eller kæglestubbformet element, hvor det kægleformede
element er anbragt i forhold til tanken (30) og transportlinjen (10) således, at en ledelinje af en ydre lateral overflade af det kegleformede element er parallel med linjens (10) fremføringsretning (W), når linjen (10) passerer nedsænket i badet i tanken (30).

9. Indretning (100) ifølge krav 8, *kendetegnet ved, at* rillen (5) udgøres af et spiralformet gevind, der er udformet på den ydre laterale overflade af det kegleformede element.

10. Indretning (100) ifølge et hvilket som helst af kravene 2 eller 4 eller 5 eller 6 eller 7 eller 8 eller 9, hvor kontakt mellemmindst et punkt af rillens (5) indre profil (51) og lågenes (20) endeparti (21) sker ved en lateral væg af rillen (51).

11. Indretning (100) ifølge et hvilket som helst af kravene 2 eller 3 eller 4 eller 5 eller 6 eller 7 eller 8 eller 9, *kendetegnet ved, at* kontakten mellem mindst et punkt af rillens (5) indre profil (51) og lågenes (20) endeparti (21) sker ved en nedre væg af rillen.

12. Indretning (100) ifølge krav 5 eller 7 eller 9, *kendetegnet ved, at* et trin i gevindet svarer til en afstand mellem transportlinjens (10) støtteelementer.

13. Indretning (100) ifølge krav 3, hvor den rørformede cylindriske kerne (400) er fastkilet på en aksel (450), *kendetegnet ved, at* den mellem akslen (450) og kernen (400) omfatter magneter (700), der er beregnet til på metallågenes (20) endepartier (21) at frembringe en radial kraft (F) rettet mod akslens (450) akse (45) med en deraf følgende positionering af lågene (20) på det samme niveau deraf.

14. Indretning (100) ifølge krav 1 eller 2 eller 3, *kendetegnet ved, at* den omfatter et børsteelement eller en roterende valse (60), der kan positioneres over rotationselementet (4), til at rense den ydre overflade (42) og den spiralformede
rille (5) (500) deri.

15. Indretning (100) ifølge krav 1, hvor kontaktenheden (40) har positiv polaritet og elektroden, der er nedsænket i badet i tanken (30), har negativ polaritet.

16. Indretning (100) ifølge krav 1, hvor kontaktenheden (40) har negativ polaritet og elektroden, der er nedsænket i badet i tanken (30), har positiv polaritet.

17. Indretning (100) ifølge krav 3, **kendetegnet ved, at** et trin i spiralen (600) svarer til afstanden mellem metallågene (20).